Antarctic Ecosystem Research Division
Southwest Fisheries Science Center
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La Jolla, California, 92037
USA

AMLR 2011 CRUISE PLAN

VESSEL: R/V *Moana Wave*

OPERATING AREA: South Shetland Islands, Antarctica

ITINERARY:

		Sea Days	Port Days
Port call in Punta Arenas	08 Jan - 10 Jan		3
Leg I	11 Jan - 10 Feb	31	
Port call in Punta Arenas	11 Feb - 12 Feb		2
Leg II	13 Feb - 15 Mar	31	
Port call in Punta Arenas	16 Mar- 18 Mar		3
Total Days		62	8

SCHEDULE OF EVENTS:

LEG I:

Transit to Copacabana field camp	4	11 - 14 Jan
Transfer personnel/gear to Copa and Calibrate in Admiralty Bay	1	15 Jan
Transfer personnel/gear to Cape Shirreff	1	16 Jan
Conduct Large-area Survey	20	17-Jan – 05 Feb
Transfer personnel and trash from Cape Shirreff	1	06 Feb
Transit to Punta Arenas	4	07-10 Feb
Total days	31	

LEG II

Transit to South Shetland Islands	4	13-16 Feb
Conduct gear comparison survey in large area	21	17 Feb – 09 Mar
Close Cape Shirreff Field Camp	1	10 Mar
Calibrate in Admiralty Bay, close Copacabana field camp	1	11 Mar
Transit to Punta Arenas	4	12-15 Mar
Total Days	31	

OVERVIEW: One of the goals of the U.S. AMLR field research program is to describe the functional relationships between krill, their predators, and key environmental variables. For the past 25 years the U.S. AMLR field program has been conducted in the vicinity of the South Shetland Islands and the Antarctic Peninsula. Shipboard sampling of these waters indicates that several water masses converge in the area, forming a hydrographic front along the shelf break north of the archipelago. High densities of phytoplankton and Antarctic krill are associated with the position of this frontal zone, although seasonal timing of their appearance can vary by several weeks. The U.S. AMLR program has also documented large year-to-year variability in the reproductive success of krill and this variability has been associated with multi-year trends in the physical environment, including sea-ice and global atmospheric patterns.

In the austral summer of 2010/2011 the U.S. AMLR program will conduct a quantitative survey of the pelagic ecosystem in the vicinity of the South Shetland Islands consisting of two 31 day legs (Figure 1). The first survey in the South Shetland Islands will be similar to the 25-year time series of bio-acoustic and net-based surveys of krill conducted by the U.S. AMLR Program, in this region. The second survey will be a comparative analysis of two mid-water net systems (Isaacs-Kidd vs. Tucker trawls) as well as an exploratory survey of pelagic finfish assemblages.

The U.S. AMLR program also monitors reproductive performance and foraging ecology of land-breeding krill predators at Admiralty Bay (Copacabana), on the south side of King George Island and at Cape Shirreff, on the north side of Livingston Island (Figure 1). Personnel occupy the field camps at both locations from October through mid-March. Provisions, gear and staff will be delivered to the Copacabana and Cape Shirreff camps at the beginning of Leg I. Personnel will be transferred from the R/V Moana Wave to Cape Shirreff at the end of Leg 1. Both field camps will be closed personnel, gear, and refuse collected at the end of Leg II.

Table 1. List of shipboard personnel for both legs.
Table 2. List of personnel for both field camps and the method of transport in and out of camp.

OBJECTIVES:

1. Conduct a bio-acoustic, oceanographic and net-based krill survey in the vicinity of the South Shetland Islands (Leg I) to map meso-scale features of water mass structure, phytoplankton biomass and productivity, zooplankton constituents, and the dispersion and population demography of krill.

2. Conduct a gear comparison survey between the 1.8m IKMT single net and the 4m^2 multiple opening and closing Tucker trawl (Leg II), and a survey of the West Shelf and Bransfield Strait regions for krill and pelagic finfish assemblages if time permits.

3. Calibrate shipboard acoustic system at Admiralty Bay the beginning of Leg I and again near the end of Leg II.

4. Collect continuous measurements of ship's position, sea surface temperature, salinity, turbidity, fluorescence, air temperature, barometric pressure, relative humidity, and wind speed and direction.

5. Collect underway observations of seabirds and marine mammals.

6. Deploy drifter buoys (number to be determined).

7. Provide logistical support to field camps at Cape Shirreff, Livingston Island and Admiralty Bay (Copacabana), King George Island. Support will include transfer of personnel, equipment, building materials, other supplies, and provisions.

8. Prepare fur seal milk for lipid analysis, process shore-based collections of fur seal diet samples, collect fur seal and penguin prey (krill, squid and fish) for lipid analysis, bomb calorimetry, and measure krill for validation of krill carapace to total length relationship.

OPERATIONS:

1.

A) South Shetland Survey, Leg I and Leg II (Figure 1). This survey will consist of approximately 112 CTD and net-sampling stations (time and weather permitting), along approximately 2400 n. miles of acoustic transects. Operations will be conducted 24 hours per day (~ 6 stations per day); desired transect speed between stations will be 10 knots, depending on sea state.

B) Gear Comparison Study, Bransfield Strait, Joinville Island and West Area. This study will consist of alternating paired sampling of the Bransfield and Joinville Island Stations (~ 50 stations) using the IKMT and the Tucker-trawl equipped with a single net, no CTD sampling and limited water sampling over the first 8 days of the study. Additional sampling may be conducted to increase the effective sample size for appropriate comparisons. Upon completion of the gear study, the Tucker Trawl (with three nets) will be deployed at all stations on the West Shelf, and time permitting, stations within the Bransfield Strait.

2.

A) Acoustic transects. Active acoustic data will be collected continuously using Simrad ES60 echosounder and hull-mounted transducers (38, 70, 120 and 200 kHz). Data will be logged and processed by computers located in the Computer Room. Continuous supply of vessel position and speed data from the ship's GPS receiver will be required in the Computer Room.

B) CTD operations. CTD casts will be conducted to 750m or 10 m from the bottom. The scientific party will supply a Seabird SBE-9/11 CTD instrument, dissolved oxygen sensor, carousel, altimeter, fluorometers, light sensors, Niskin bottles and stand. A computer, also supplied by the scientific party, will be located in the Computer Room to log CTD data. The ship will supply a winch, conducting cable with strain relief and electrical termination, slip rings, a deck cable terminating in the Computer Room, and a method for monitoring the amount of wire out and the rate of recovery. Water samples (10 per cast) will be obtained at a series of standard depths. Assistance from ship's personnel may be required in collecting water samples from the Niskin bottles for both salinity measurements and phytoplankton analyses. Measurements of the salinity of the water samples will be determined using a Guildline PortaSal salinometer, and dissolved oxygen levels will be determined at two stations per day to calibrate electronic instruments on the CTD.

C) Net sampling operations. During both legs of the survey, a standard 1.8 m IKMT fitted with 505-micron mesh net, supplied by the scientific party, will be used to sample zooplankton and micronekton (including krill). The ship will supply a second winch, conducting cable with strain relief and electrical termination, slip rings, a deck cable terminating in the Computer Room, and a method for monitoring the amount of wire out and the rate of recovery.

Primary sample processing during Leg I will be conducted in laboratory compartments within the ship. Antarctic krill (*Euphausia superba*) will be separated from the catch and enumerated; salps (*Salpa thompsoni*) will be separated, counted and morphometric measurements collected from a sub-sample of the catch; other adult and larval euphausiids, ichthyoplankton, and zooplankton material will be identified, counted and preserved. Sub-samples of *E. superba* from each tow will be processed in the onboard laboratory space to determine length distribution of krill, maturity stage, molt stage, sex ratio, and reproductive condition. Myctophid fish will be processed to determine species, length, weight, sex, gut contents, etc.

During Leg II, sample processing will be similar to Leg I, with separate measurements conducted for each net from among the Tucker Trawl and IKMT nets. Particular attention will be placed on ensuring comparable measurements of krill, abundance and size during the gear comparison study, and pelagic finfish abundance and demographics as well as krill abundance and zooplankton composition during the West and secondary Bransfield Strait surveys.

D) Phytoplankton operations: At every CTD station, water will be sampled for chlorophyll concentrations at all depths in which Niskin bottles are fired, between 5 and 200 meters. A deck cell for the collection of PAR will be installed on the ship super structure. Assistance from the deck crew may be required to properly and efficiently collect water samples for phytoplankton and chl-a determinations.

E) XBT and XCTD operations: Probes will be deployed to collect temperature data to depths of up to 750 meters, during the Drake Passage transits and at other times during the cruise. The expendable probes are launched from the side of the ship while underway along a high density line, every 15km, from the polar front (58 degrees South) to the South Shetland Islands during southward transits. On northward transits of the Drake Passage, we will repeat similar deployments. Opportunistic sampling will be conducted between the Shackleton Ridge and Elephant Island, across the Bransfield Strait and along certain AMLR transects at 4km intervals.

F) **Continuous Underway Plankton Recorder (CPR).** The CPR will be deployed during transits across Drake Passage using an available wire. The CPR will be towed at 10m depth, and all SCS and underway data will be collected and archived for delivery to the CPR Program in Australia.

3. **Acoustic system calibration, Legs I and II.** At the beginning of Leg I and again at the end of Leg II, the ship will anchor in approximately 25 fathoms of water in Admiralty Bay (either Ezcurra or Martel Inlet, depending on ice and wind conditions) for the purpose of calibrating the acoustic system. Ship's personnel will be required to run a weighted transfer line under the hull before deploying the anchor. The scientific party will supply all additional hardware and cables required for calibration. Historically, the best and most efficient calibration occurs with propellers disengaged from the shafts so that they do not turn.

4. **Continuous environmental data collection, Legs I and II.** During Legs I and II a meteorological instrument package will be mounted on the ship's forward mast and a coax cable led to computers located in the Computer Room. The ship will provide a continuous salt water supply to the thermosalinograph, supplied by the scientific party. Continuous measurements of sea surface temperature and salinity, air temperature, barometric pressure, relative humidity, wind speed, wind direction, scalar and cosine PAR, and shortwave radiation will be collected and logged on data-logging computers located in the Computer Room. The ship will provide data feeds from the ship's GPS receiver and gyro compass to computer room for this navigational data logging.

5. **Deploying drifters:** Drifters will be deployed from the ship. Drifters will be released on three of the four transits between the SSI region and Punta Arenas, south of 58S. Additional drifters will be deployed in the Elephant Island region and in the Weddell as directed by the chief scientist.

6. **Seabird and marine mammal observation.** Seabird and marine mammal observations will be made from one of the bridge wings or inside the pilot house during inclement weather along transects between stations and during the transits to and from Punta Arenas. Access to GPS position data and electrical power inside the pilot house will be required for a laptop computer.

7. **Garbage removal:** At every opportunity when visiting camps, and especially at the end of Leg1 and Leg II, we shall offload garbage from Cape Shirreff and at Copacabana. This will also occur at the beginning of the survey at both sites weather permitting.

8. **Field camp logistical support, Legs I and II.** The scientific party will provide two Zodiac Mark V's and four outboard motors for the following operations:

- At the beginning of Leg I, personnel and gear, including food, will be dropped off at Copacabana field camp. Trash may be recovered to the ship. The acoustic system will be calibrated in Admiralty Bay.
- At the beginning of Leg I, personnel and gear, including food, will be dropped off at Cape Shiirreff. Trash may be recovered to the ship.
- At the end of Leg I, personnel, equipment, and trash will be recovered from Cape Shirreff. Jefferson Hinke will be transferred from the R/V Moana Wave to Cape Shirreff as well.
- Near the end of Leg II, personnel, equipment and trash will be recovered from Cape Shirreff in effect closing the field camp for the season.
- Near the end of Leg II, personnel, equipment and trash will be recovered from the Copacabana field camp in effect closing the field camp for the season.
- The acoustic system will also be re-calibrated in Admiralty Bay at the end of Leg II.
- Daily radio communications will be maintained between the various field sites and the ship. The Cruise Leader will provide instructions for these radio communications.

MAJOR EQUIPMENT AND SUPPLIES TO BE LOADED ABOARD SHIP

1. 20-foot laboratory van
2. 12-foot laboratory van
3. Two Zodiac inflatable boats
4. Four outboard motors
5. Small amount of lumber and building supplies for field camps
6. One 55-gallon drum of gasoline for outboard motors
7. 30-60 propane cylinders
8. 1 tank of nitrogen gas
9. Various chemicals to be stored in the Dry Laboratory (designated for phytoplankton work). MSDS forms will accompany all chemicals used by the phytoplankton group.

EQUIPMENT AND CAPABILITIES TO BE SUPPLIED BY THE SHIP:

1. INMARSAT telephone line and modem port supplied to the Computer Room.
2. Global Positioning Systems (GPS) with NEMA 0183 output in RS232 format, supplied to the Computer Room.
3. Heading output from gyrocompass to be supplied to a data-logging computer (supplied by scientific party) in Computer Room.
4. Location on forward mast to mount portable WeatherPak instrument (supplied by scientific party).
5. 110v, 60 cycle, 45 amp regulated electrical power supplied to the Computer Room and wet Laboratory.
6. 110v, 15 amp electrical power supplied to the wet and dry laboratories.
7. Winch with conducting cable, slip rings, and meter for deployment of the large CTD stand. The sea cable will be fairleaded through the central A-frame and the deck cable will be terminated in the Computer Room.
8. Winch with conducting cable, slip rings and meter for deployment of the IKMT net. The sea cable will be fairleaded through the central A-frame and the deck cable will be terminated in the Computer Room.
9. Continuous salt water supply to scientific party's flow-through instruments located in wet Laboratory.
10. Assistance in loading scientific equipment, securing it in place, and providing power, water, and drain connections.
11. Swimmers in dry suits to assist with Zodiac landings at the field camps.
12. Assistance in drawing water samples from the Niskin bottles.

SOUTHWEST FISHERIES SCIENCE CENTER CONTACT:

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SHIPBOARD CONTACT:

INMARSAT Voice/Fax
Tel: (Region code) TBD
Fax: (Region code) TBD

Region codes:
871-Atlantic Ocean region (East)
872-Pacific Ocean region
873-Indian Ocean regoin
874- Atlantic Ocean region (West)
870-UNIVERSAL

Table 1. Shipboard personnel
Table 2. Field Camp Personnel
Figure 1. AMLR 2011 station plan.

Kristen Koch
Acting Director
Southwest Fisheries Science Center

George Watters
Director of Antarctic
Ecosystem Research Division

Table 1. Shipboard personnel

Leg I	Leg II
Christian Reiss (cruise leader)	Christian Reiss (cruise leader)
Anthony Cossio (acoustics)	Christopher Jones (fish leader)
Derek Needham (oceanography)	Anthony Cossio (acoustics)
Andre Hoek (oceanography)	Derek Needham (oceanography)
Guido Bordignon (phytoplankton)	Andre Hoek (oceanography)
Stephanie Sexton (phytoplankton)	Kimberly Dietrich (zooplankton)
Kimberly Dietrich (zooplankton)	Suzanne Romain (zooplankton)
Suzanne Romain (zooplankton)	Nissa Ferm (zooplankton)
Nissa Ferm (zooplankton)	Ian Bystrom (zooplankton)
Ian Bystrom (zooplankton)	Lars Thoresen (zooplankton)
Ryan Driscoll (zooplankton)	Michael Janssen (zooplankton)
Jefferson Hinke(zooplankton)	Cassandra Brooks (zooplankton)
Lars Thoresen (zooplankton)	Darci Lombard (zooplankton)
Andrea Pesce (zooplankton)	Phillipe Koubbi (fish)
Michael Janssen (zooplankton)	Barbara Catalano (fish)
Jarrod Santora (seabirds)	Mike Force (seabirds)
Mike Force (seabirds)	Amy Van Cise (lipids/scat/phyto)
Jen Walsh (lipids/scat)	Raul Vasquez del Mercado (support)
Raul Vasquez del Mercado (support)	
Plus 5 on southbound transit	Plus 0 on southbound transit
Plus 4 on northbound transit	Plus 10 on northbound transit

Table 2. Field camp personnel

Cape Shirreff	In to camp via	Out of camp via
Nicola Pussini (camp leader)	*LM Gould*, Nov 2010	*M Wave*, Mar 2011
McKenzie Mudge	*LM Gould*, Nov 2010	*M Wave*, Mar 2011
Kevin Pietrzak	*LM Gould*, Nov 2010	*M Wave*, Mar 2011
Allyson Larned	*LM Gould*, Nov 2010	*M Wave*, Mar 2011
Ray Buchheit	*LM Gould*, Nov 2010	*M Wave*, Mar 2011
Jefferson Hinke	*M Wave*, Jan 2011	*M Wave*, Mar 2011
Wayne Perryman	*M Wave,* Jan 2011	*M Wave,* Feb 2011
Nancy Ash	*M Wave,* Jan 2011	*M Wave,* Feb 2011
Steve Gardner	*M Wave,* Jan 2011	*M Wave,* Feb 2011
Don LeRoi	*M Wave,* Jan 2011	*M Wave,* Feb 2011
Copacabana		
Sue Trivelpiece (camp leader)	*LM Gould*, Oct 2010	*Orlova*, Dec 2010
Alexis Will	*LM Gould*, Oct 2010	*M Wave*, Mar 2011
Penelope Chilton	*LM Gould*, Oct 2010	*M Wave*, Mar 2011
Kristen Boysen	*LM Gould*, Oct 2010	*M Wave*, Mar 2011
Wayne Trivelpiece	*M Wave,* Jan 2011	*M Wave*, Mar 2011

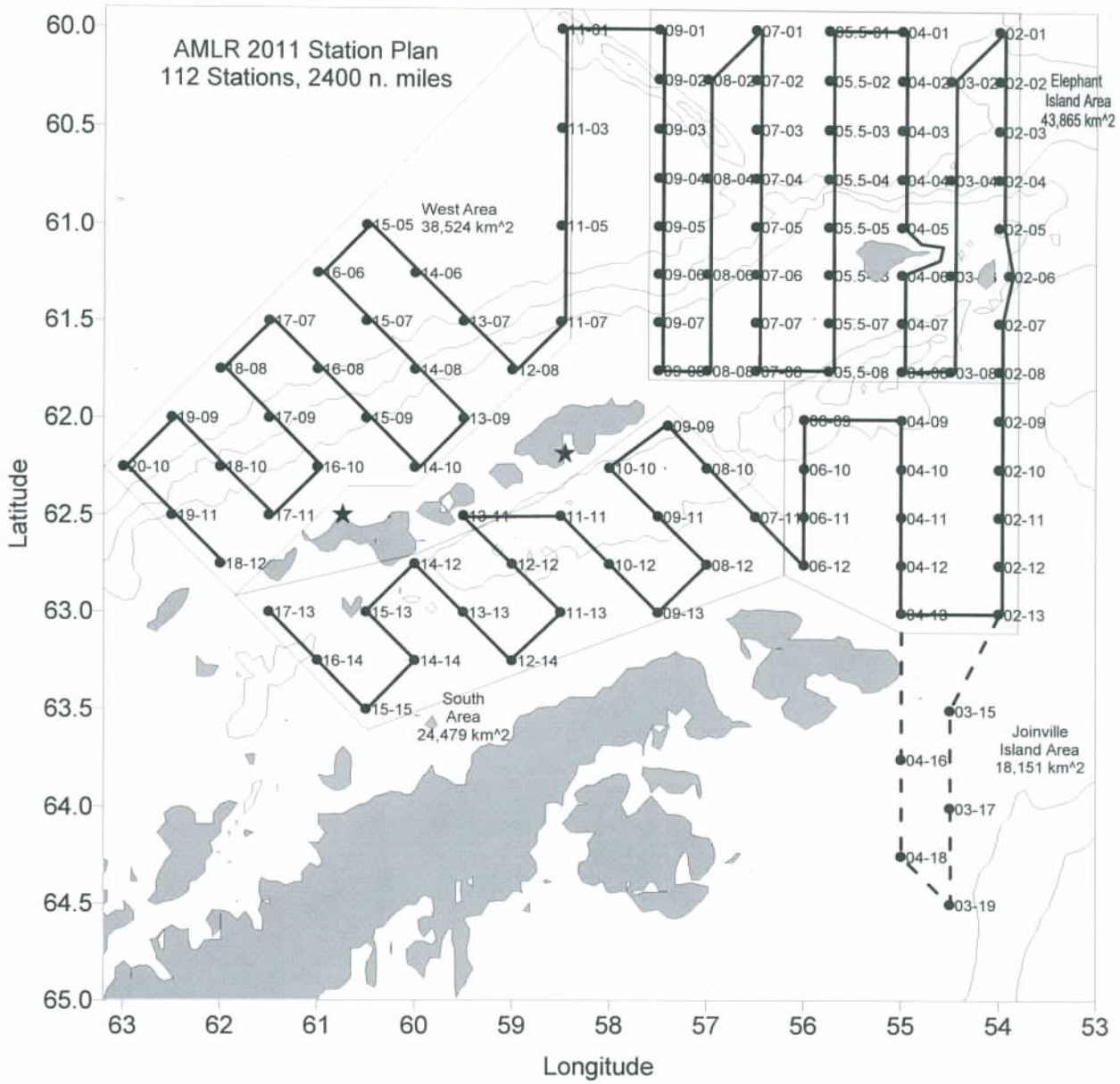

Figure 1. AMLR 2011 station plan. Black dots indicate station locations; heavy lines indicate transects between stations; thin lines outline stratum; stars indicate locations of Cape Shirreff and Copacabana field camps; depth contours are 1000, 2000, and 3000 m. Surveys will be conducted in the following order: West Area, then Elephant Island Area, then Joinville Island Area, then stations in northwest Weddell Sea (if ice conditions permit), then South Area.